IEEE 802.3 de-mustified

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Introduction

The IEEE SA Standards Board Operations Manual 6.4.7 contains requirements reflected in Maintenance request 1361, which adds a new Subclause 1.1.6 "Word usage" to the 802.3 revision draft that includes two footnotes:

1. The use of the word *must* is deprecated and cannot be used when stating mandatory requirements; *must* is used only to describe unavoidable situations.

2. The use of *will* is deprecated and cannot be used when stating mandatory requirements; *will* is only used in statements of fact.

However, IEEE P802.3 (IEEE 802.3dc) Draft 2.0 contains 620 instances of the word "must".

This document proposes changes to be made to the revision draft to remove the word "must".

For "must" this version covers all of the 614 instances not in the front matter or note given above.

Also, one instance of "will" is covered to bring all instances of that particular phrase back to being the same.

This document also proposes changes to be made to the two additional approved amendments IEEE Std 802.3ct-2021 and IEEE Std 802.3cp-2021, when included, to remove the word "must".

Following changes in IEEE Std 802.3cu-2021

Change "a conforming implementation must behave functionally as though" to:
"a conforming implementation behaves functionally as though" in 37 places:
Table 53-1 footnote a, Table 54-1 footnote a, Table 70-1 footnote a, Table 71-1 footnote a,
Table 72-1 footnote a, Table 84-1 footnote a, Table 85-1 footnotes a and b, Table 86-1 footnote a,
Table 87-1 footnote a, Table 88-1 footnote a, Table 89-1 footnote a, Table 92-1 footnote a,
Table 93-1 footnote a, Table 94-1 footnote a, Table 95-1 footnote a, Table 110-1 footnote a,
Table 111-1 footnote a, Table 112-1 footnote a, Table 114-1 footnote a, Table 121-1 footnote a,
Table 122-1 footnote a, Table 123-1 footnote a, Table 124-1 footnote a, Table 128-1 footnote a,
Table 130-1 footnote a, Table 136-1 footnote a, Table 136-2 footnote a, Table 136-3 footnote a,
Table 137-1 footnote a, Table 137-2 footnote a, Table 137-3 footnote a, Table 138-1 footnote a,
Table 138-2 footnote a, Table 138-3 footnote a, Table 139-1 footnote a, Table 150-1 footnote a.

Change "the maximum differential group delay that the system must tolerate" to:
"the maximum differential group delay that the system is required to tolerate" in 9 places:
Table 52-24 footnote g, Table 87-14 footnote c, Table 88-14 footnote c, Table 89-13 footnote c,
Table 114-11 footnote d, Table 121-13 footnote c, Table 122-17 footnote e, Table 124-11 footnote c,
Table 139-12 footnote d.

Delay

Change "This implies that MAC, MAC Control sublayer, and PHY implementers must conform to" to:
"This implies that MAC, MAC Control sublayer, and PHY implementers conform to" in 18 places:
24.6, 36.5, 40.11, 44.3, 46.1.4, 48.5, 49.2.15, 53.2, 69.3, 74.6, 80.4, 99.4.8, 105.5, 116.4, 125.3, 127.5, 129.5, 131.4.

Change "This implies that MAC, MAC Control sublayer, and PHY implementers must consider the" to:
"This implies that MAC, MAC Control sublayer, and PHY implementers consider the" in 5 places:
70.4, 71.4, 72.4, 128.4, 130.4.

Change "This implies that MAC, MAC Control sublayer, and PHY implementers will conform to" to:
"This implies that MAC, MAC Control sublayer, and PHY implementers conform to" in 1 place:
51.33.

Change "This implies that implementers of MAC, MAC Control, and PHY must consider the" to:
"This implies that implementers of MAC, MAC Control, and PHY consider the" in 1 place: 54.3.

Change "This implies that MAC, PHY, and repeater implementers must conform to" to:
"This implies that MAC, PHY, and repeater implementers conform to" in 3 places: 24.6, 36.5, 40.11.

Change "This implies that MAC, PHY and repeater implementers must conform to" to:
"This implies that MAC, PHY, and repeater implementers conform to" in 1 place: 32.12.

Skew

Change "must be kept within limits" to:
"is kept within limits" in 22 places:
80.5, 83.5.3, 84.5, 85.5, 86.3.2, 87.3.2, 88.3.2, 89.3.2, 92.5, 93.5, 94.3.4, 95.3.2,
116.5, 120.5.3, 131.5, 135.5.3, 136.6, 137.6, 138.3.2, 139.3.2, 140.3.2, 150.3.2.

Change "must be kept within limits" to:
"are kept within limits" in 4 places: 121.3.2, 122.3.2, 123.3.2, 124.3.2.

Change "must tolerate Skew Variation" to:
"is required to tolerate Skew Variation" in 3 places: 83.5.3, 120.5.3, 135.5.3.

Change "Skew Variation must be limited to ensure" to:
"Skew Variation is limited to ensure" in 2 places: 80.5, 131.5.

Change "The Skew Variation must also be limited to ensure" to:
"The Skew Variation is also limited to ensure" in 12 places:
84.5, 85.5, 86.3.2, 87.3.2, 88.3.2, 89.3.2, 136.6, 137.6, 138.3.2, 139.3.2, 140.3.2, 150.3.2.

Note that the "from" phrase for these two sets of changes is the same. The choice between "is" and "are" in the "to" phrase depends in the earlier text.

General 1

Change "one or more nomenclatures must meet" to:
"one or more nomenclatures meet" in 2 places: 80.1.5, 125.1.4.

Change "one or more PHY types must meet" to:
"one or more PHY types meet" in 2 places: 116.1.4, 131.1.4.

Change "An exit transition arrow must connect to the shared arrow, and the qualifier must be met prior to termination of" to:
"An exit transition arrow connects to the shared arrow, and the qualifier is met prior to termination of" in 4 places: 80.6, 105.6, 116.7, 131.6.

Change "When using this method the RS must maintain a Deficit Idle Count (DIC)" to:
"When using this method the RS maintains a Deficit Idle Count (DIC)" in 2 places: 46.3.1.4, 81.3.1.4.

Change "lane markers must match each other and an entry" to:
"lane markers have to match each other and an entry" in 1 place: 82.2.19.3.

Change "a conforming implementation must behave as though the interface were compliant" to:
"a conforming implementation behaves as though the interface were compliant" in 1 place: 86.5.1.

General 2

Change "As an unavoidable consequence of the requirements for the setting of the SIGNAL_DETECT parameter, implementations must provide adequate margin" to:
"As a consequence of the requirements for the setting of the SIGNAL_DETECT parameter, implementations need to provide adequate margin" in 23 places:
38.2.4, 39.2.3, 52.4.4, 53.4.4, 58.2.4, 59.2.4, 68.4.4, 86.5.4, 87.5.4, 88.5.4, 89.5.4, 95.5.4, 112.5.4, 114.5.4, 121.5.4, 122.5.4, 123.5.4, 124.5.4, 138.5.4, 139.5.4, 140.5.4, 150.5.4, 151.5.4.

Change "must exceed this value" to:
"has to exceed this value" in 13 places:
Table 52-12 footnote c, Table 52-16 footnote d, Table 86-6 footnote b, Table 87-7 footnote b, Table 88-7 footnote b, Table 95-6 footnote b, Table 114-6 footnote b, Table 121-6 footnote b, Table 122-9 footnote b, Table 122-10 footnote c, Table 138-8 footnote b, Table 139-6 footnote b, Table 150-7 footnote b.

Change "must exceed these values" to:
"has to exceed this value" in 1 place: Table 124-6 footnote b.

Change "lane alone must be found" to:
"lane alone has to be found" in 2 places: 86.8.2.1, 95.8.1.1.

Change "must be corrected for" to:
"has to be corrected for" in 5 places: 52.9.10.3, 58.7.9.3, 87.8.6.3, 88.8.5.3, 114.7.5.3.

General 3

Change "must be created with" to:
"has to be created with" in 4 places: 52.9.9.3, 58.7.11.2, 87.8.11.2, 95.8.8.2.

Change "must be maintained" to:
"has to be maintained" in 2 places: 32.7.2.3.5, 94.3.10.6.4.

Change "update requests must not be sent in combination with" to:
"update requests are not sent in combination with" in 1 place: 94.3.10.6.4.

Change "This value must also be" to:
"This value also has to be" in 4 places: 83E.3.3.2.1, 83E.3.4.1.1, 120E.3.3.2.1, 120E.3.4.1.1.

Change "must be high enough to overcome" to:
"has to be high enough to overcome" in 1 place: 86A.5.3.2.

Change "the CDR must track additional" to:
"the CDR has to track additional" in 1 place: 86A.5.3.8.3.

Change "performance is critical and must not be sacrificed by" to:
"performance is critical and should not be sacrificed by" in 1 place: 86A.5.3.8.4.

Change "Care must be taken when" to:
"Care should be taken when" in 1 place: 86A.5.3.8.5.

General 4

Change "must be accounted for" to:
"have to be accounted for" in 2 places: Table 68-3 footnote b, 86A.5.3.8.5.

Change "must be chosen" to:
"should be chosen" in 1 place: 93A.1.5 Note 1.

Change "must be OK before" to:
"has to be OK before" in 2 places: 40.4.5.2, 96.4.7.2.

Change "The generator of the disturbing signal must have sufficient linearity and range so it does not introduce any appreciable distortion" to:
"The generator of the disturbing signal should have sufficient linearity and range that it does not introduce any appreciable distortion" in 2 places: 40.6.1.1.3, 96.5.3.

Change "a non-MDI connector that is not isolated from the MDI leads must provide isolation" to:
"a non-MDI connector that is not isolated from the MDI leads needs to provide isolation" in 1 place: 104.6.1.

Change "Transition_count must comply with the state diagram description" to:
"Transition_count has to comply with the state diagram description" in 3 places:
55.4.5.1, 113.4.5.1, 126.4.5.1.

General 5

Change "As the SLAVE must maintain timing lock with the MASTER, the timing relationship between the LPI quiet-refresh cycling of the two PHYs must remain fixed for the lifetime of the link." to:
"As the SLAVE has to maintain timing lock with the MASTER, the timing relationship between the LPI quiet-refresh cycling of the two PHYs has to remain fixed for the lifetime of the link." in 1 place: 146.4.7.

Change "function must achieve proper synchronization" to:
"function has to achieve proper synchronization" in 1 place: 147.4.3

Change "on transmitter noise must be compensated for" to:
"on transmitter noise has to be compensated for" in 1 place: 121.8.5.3.

Change ", EEE-capable PHYs must synchronize refresh intervals" to:
", EEE-capable PHYs synchronize refresh intervals" in 2 places: 55.3.5.1, 126.3.5.1.

Change "the MASTER must set" to:
"the MASTER sets" in 2 places: 55.4.2.5.14, 126.4.2.5.15.

Change "This must be calculated over" to:
"This is calculated over" in 1 place: 126.7.3.1.

General 6

Change "frequency points must be measured" to:
"frequency points are measured" in 1 place: 126.7.3.1.

Change "valid code-groups must follow the rules" to:
"valid code-groups have to follow the rules" in 5 places:
36.2.5.1.1, 48.2.6.1.1 (2 places), 65.2.3.4.2, 127.2.7.1.1.

Change "The minimum number must be" to:
"The minimum number has to be" in 1 place: 127.2.7.1.2.

Change "received bits must be buffered" to:
"received bits have to be buffered" in 3 places: 24.2.2.3, 36.3.2.1, 127.3.2.

Change "must all extend beyond this mask" to:
"all have to extend beyond this mask" in 1 place: 120E.4.2.

Change "eye must extend beyond" to:
"eye has to extend beyond" in 3 places: Figure 120E-14 (3 places).

Change "operation must complete within" to:
"operation has to complete within" in 1 place: 45.2.1.30.2.

General 7

Change "therefore must be performed only" to:
"therefore is performed only" in 1 place: 45.2.6.9.1.

Change "entity must have a priori knowledge" to:
"entity has to have a priori knowledge" in 1 place: 45.3.5.

Change "must be less than" to:
"has to be less than" in 3 places: 9.5.6.4, B.1.5.2, 47.3.3.5.

Change "must be adequate to" to:
"needs to be adequate to" in 2 places: 47.4.2, 58.7.9.2.

Change "must have vertical waveform symmetry" to:
"has to have vertical waveform symmetry" in 1 place: 47.4.3.2.

Change "must be inserted in each lane" to:
"has to be inserted in each lane" in 1 place: 48.2.4.2.3.

Change "must delete idles or" to:
"deletes idles or" in 1 place: 49.2.5.

General 8

Change "must also implement the" to:
"also implements the" in 1 place: 50.1.5.

Change "must be processed" to:
"have to be processed" in 1 place: 50.1.7.

Change "must implement the" to:
"implements the" in 1 place: 50.3.6.

Change "must be presented" to:
"have to be presented" in 1 place: 50.3.6.

Change "must be included" to:
"has to be included" in 2 places: 37.2.5, 50.3.7.

Change "must progress" to:
"progresses" in 1 place: 50.4.2.

Change "that must be matched" to:
"that need to be matched" in 1 place: 50.4.2.

General 9

Change "capabilities must be provided" to:
"capabilities have to be provided" in 3 places: 50.6.4.6 MR1 and MR2, 50.6.4.7 TP5.

Change "hexadecimal must be transmitted" to:
"hexadecimal is transmitted" in 1 place: 50.6.4.6 MR4.

Change "must be ignored" to:
"is ignored" in 1 place: 50.6.4.6 MR5.

Change "combination must be configured" to:
"combination is configured" in 2 places: 52.9.6.2, 58.7.7.2.

Change "Receivers must operate with" to:
"Receivers have to operate with" in 1 place: 52.9.9.

Change "must be added" to:
"has to be added" in 2 places: 52.9.9.3, 58.7.11.2.

Change "must be well within" to:
"should be well within" in 2 places: 52.9.9.3, 58.7.11.2.

General 10

Change "must begin to track" to:
"has to begin to track" in 2 places: 53.8.2.1, 53.9.10.1.

Change "must be asynchronous to" to:
"has to be asynchronous to" in 3 places: 53.9.7, 53.9.10.1, 53.9.12.4.

Change "must be sufficient" to:
"needs to be sufficient" in 3 places: 38.6.12, 53.9.13, 59.7.15.

Change "must be explicitly placed" to:
"has to be explicitly placed" in 3 places: 54.5.8, 70.6.6, 71.6.8.

Change "must correctly drive" to:
"has to correctly drive" in 2 places: 45A.3, 45A.4.

Change "must have knowledge" to:
"needs to have knowledge" in 2 places: 45A.3, 45A.4.

Change "must drive the" to:
"has to drive the" in 6 places: 45A.3 (3 places), 45A.4 (3 places).

General 11

Change "must be capable of generating" to:
"has to be capable of generating" in 1 place: 45A.4.

Change "(time) must be calculated" to:
"(time) has to be calculated" in 1 place: 48B.1.1.

Change "must be multiplied" to:
"is multiplied" in 1 place: 48B.1.1.

Change "must be Gaussian" to:
"has to be Gaussian" in 1 place: 48B.2.1.

Change "must be from" to:
"has to be from" in 1 place: 48B.2.1.

Change "must be understood" to:
"need to be understood" in 1 place: 48B.2.1.

Change "must be verified" to:
"has to be verified" in 1 place: 48B.2.1.

General 12

Change "must be performed using" to:
"is performed using" in 1 place: 48B.2.1.

Change "it must be ok" to:
"it has to be ok" in 1 place: 48B.3.1.

Change "must be notified" to:
"has to be notified" in 4 places: 13.4.1, 29.3.1, 42.3.1, 50A.

Change "must fall within the operating" to:
"has to fall within the operating" in 6 places:
Table 58-3 footnote b, Table 58-5 footnote b, 58.7.2, Table 59-3 footnote b, Table 59-6 footnote b, 59.7.2.

Change "must ensure adequate" to:
"need to ensure adequate" in 3 places: 58.7, 59.7, 60.9.

Change "must use this" to:
"use this" in 1 place: 56.1.

Change "must specify" to:
"has to specify" in 4 places: 2.3.1.2 (2 places), 57.2.8.1.2 (2 places).

General 13

Change "must fall within the white" to:
"have to fall within the white" in 1 place: 58.7.12.

Change "must be conformed" to:
"has to be verified" in 1 place: 60.9.13.1.2.

Change "must be met in" to:
"has to be met in" in 2 places: 60.9.13.2.2, 75.7.15.2.

Change "must ensure that" to:
"has to ensure that" in 3 places: 32A, 40C, 61.2.2.5.

Change "Must process all" to:
"Process all" in 1 place: 64.4.4.1 CC3.

Change "must maintain an" to:
"has to maintain an" in 1 place: 65.1.3.3.1.

Change "must first synchronize" to:
"first has to synchronize" in 1 place: 65.2.3.2.3.

General 14

Change ", FEC function must maintain" to:
", the FEC function maintains" in 1 place: 65.2.3.3.1.

Change "must support" to:
"has to support" in 2 places: 28.1.4, Table 68-3 footnote d.

Change "waveform must be circularly shifted" to:
"waveform is circularly shifted" in 1 place: 68.6.6.2.

Change "must be even" to:
"has to be even" in 1 place: 68.6.6.2.

Note that these two changes would require a new version of https://www.ieee802.org/3/publication/aq/802.3aq-2006clause68TWDP.zip

Change "that must be within" to:
"that has to be within" in 1 place: B.4.3.1.

Change "It must be within" to:
"It has to be within" in 1 place: 39.6.8.2.

Change "must be within 5%" to:
"are within 5%" in 3 places: 72.10.4.5 TC26 (3 places).

Change "must be read" to:
"has to be read" in 2 places: 28.2.1.2.5, 73.6.8.

General 15

Change "one must be transmitted" to:
"one have to be transmitted" in 2 places: 28.3.1 ack_finished, 73.10.1 ack_finished.

Change "must be greater" to:
"has to be greater" in 5 places:
9.5.6.4, B.5.2 (2 places), 28.3.2 link_fail_inhibit_timer, 73.10.2 link_fail_inhibit_timer.

Change "must be triggered" to:
"has to be triggered" in 1 place: 58A.

Change "must have valid" to:
"has to have valid" in 1 place: Figure 61A-3.

Change "must be split" to:
"has to be split" in 1 place: 61B.3.1.

Change "must be contained" to:
"has to be contained" in 2 places: 38.11.4, 67A.3.

Change "must be able" to:
"has to be able" in 1 place: 69A.1.

General 16

Change "must be considered" to:
"have to be considered" in 2 places: 14.4.1, 69B.4.1.

Change "must report" to:
"have to report" in 2 places: 22.1.3, 35.1.3.

Change "must encompass" to:
"has to encompass" in 2 places: 22.2.2.7, 35.2.2.7.

Change "must be passed" to:
"has to be passed" in 2 places: 22.2.2.8, 35.2.2.8.

Change "Must produce" to:
"Produce" in 3 places: 22.8.3.1, 35.6.3.1 PL1 and PL2.

Change "Must send ONE" to:
"Send ONE" in 1 place: 35.6.3.1 PL3.

Change "must send more" to:
"has to send more" in 1 place: 9.6.3.

General 17

Change "must deassert" to:
"has to deassert" in 1 place: 36.2.4.16.

Change "that must occur" to:
"that have to occur" in 5 places: 9.6.6.2, 27.3.2.1.1 (2 places), 41.2.2.1.1 (2 places).

Change "that must be present" to:
"that has to be present" in 9 places: 27.3.2.1.4 (5 places), 41.2.2.1.4 (4 places).

Change "which must be present" to:
"which has to be present" in 1 place: 41.2.2.1.4.

Change "must be avoided" to:
"have to be avoided" in 6 places: 14.7.2, 23.9.2, 27.5.2, 32.10.2, 40.9.2, 41.4.2.

Change "measures must be taken" to:
"measures have to be taken" in 7 places: 8.7.2, 14.7.2, 23.9.2, 27.5.2, 32.10.2, 40.9.2, 41.4.2.

Change "must be validated" to:
"has to be validated" in 3 places: 13.4, 29.3, 42.3.

General 18

Change "must be possible" to:
"has to be possible" in 3 places: 13.4.1, 29.3.1, 42.3.1.

Change "must contain" to:
"has to contain" in 5 places: 2.3.1.2, 13.4.1, 29.3.1, 31.3.1.2, 42.3.1.

Change "must be qualified" to:
"has to be qualified" in 3 places: 13.4.1, 29.3.1, 42.3.1.

Change "qualification must be done" to:
"qualification needs to be done" in 3 places: 13.4.1 , 29.3.1, 42.3.1.

Change "must be specified" to:
"needs to be specified" in 2 places: 29.3.1.2 Note 2, 42.3.1.2 Note 2.

Change "must alternate" to:
"have to alternate" in 4 places: Table 36B-1 footnote b, Table 36B-2 footnote b, Table 36B-3 footnotes b and c.

Change "must be increased" to:
"has to be increased" in 2 places: 23C, 40B.1.

General 19

Change "must be applied" to:
"has to be applied" in 1 place: 40B.1 Note.

Change "user must first" to:
"user has to first" in 1 place: 40C.2.1.

Change "Must provide a sufficiently" to:
"Provide a sufficiently" in 2 places: 28.1.2 e), 37.1.2 b).

Change "Must allow manual" to:
"Allow manual" in 2 places: 28.1.2 f), 37.1.2 c).

Change "Must be capable of operation" to:
"Capable of operation" in 2 places: 28.1.2 g), 37.1.2 d).

Change "Must allow the ability" to:
"Allow the ability" in 1 place: 37.1.2 e).

Change "Must operate when" to:
"Operates when" in 2 places: 28.1.2 i), 37.1.2 f).

General 20

Change "Must be robust" to:
"To be robust" in 2 places: 28.1.2 o), 37.1.2 j).

Change "Must not significantly" to:
"To not significantly" in 2 places: 28.1.2 p), 37.1.2 k).

Change "Must interoperate with" to:
"Interoperate with" in 1 place: 28.1.2 a).

Change "Must allow automatic" to:
"Allow automatic" in 1 place: 28.1.2 b).

Change "Must not preclude" to:
"Does not preclude" in 1 place: 28.1.2 h).

Change "Must not cause corruption" to:
"Does not cause corruption" in 1 place: 28.1.2 m).

Change "must terminate" to:
"has to terminate" in 1 place: 37.2.4.3.

General 21

Change "must be checked" to:
"has to be checked" in 2 places: 8.8.3.1, 38.12.3 *SX.

Change "must be calibrated" to:
"has to be calibrated" in 3 places: 39.6.2, 39.6.4, 39.6.5.

Change "must either be" to:
"has to either be" in 1 place: 39.6.3.

Change "percentages must be measured" to:
"percentages have to be measured" in 1 place: 39.6.3

Change "must be made" to:
"has to be made" in 3 places: 8.6.2.1, 15.2.2, 39.6.4.

Change "must be filtered" to:
"have to be filtered" in 2 places: 39.6.4, 39.6.8.1.

Change "MDI must be provided" to:
"MDI has to be provided" in 1 place: 39.8.3 *STY1.

General 22

Change "must operate as" to:
"operates as" in 7 places: 9.6.5, 32.2.2.1.1 (3 places), 40.2.4.1 (3 places).

Change "must be stable" to:
"has to be stable" in 3 places: 23.4.1.7, 32.4.1.1.5, 40.4.2.6.

Change "must be addressed" to:
"needs to be addressed" in 1 place: 40.6.1.2.

Change "Must have 2047" to:
"Need to have 2047" in 1 place: 40.6.1.2.4.

Note that this change would require a new version of
https://www.ieee802.org/3/publication/ab/distortion.m.txt

Change "must meet the specification" to:
"has to meet the specification" in 1 place: 40.7.5 g).

Change "function must be implemented" to:
"function has to be implemented" in 2 places: 28.1.4, 40.8.2.

Change "must be insignificant" to:
"has to be insignificant" in 4 places: 23.5.1.2.6 Note, 32.6.1.4.2 Note, 32.6.1.4.3 Note, 40.8.3.2 Note 2.

General 23

Change "requirement must be met" to:
"requirement has to be met" in 1 place: 21.6.2.

Change "must cause a transition" to:
"causes a transition" in 2 places: 22.2.1.3.3 (2 places).

Change "must then ensure" to:
"has to then ensure" in 1 place: 22.2.1.5.

Change "must provide a TX_CLK" to:
"has to provide a TX_CLK" in 2 places: 22.2.2.1 (2 places).

Change "must not be looped" to:
"is not looped" in 1 place: 22.2.2.8.

Change "must be cleared" to:
"have to be cleared" in 1 place: Table 22-7 footnote b.

Change "must have prior" to:
"has to have prior" in 1 place: 22.2.4.5.5.

General 24

Change "requirements must be met" to:
"requirements have to be met" in 2 places: 22.3.2.2, 22.3.2.3.

Change "must also meet" to:
"also have to meet" in 1 place: 22.4.3.2.

Change "must switch the" to:
"has to switch the" in 1 place: 22.4.3.2.

Change "must not cause the" to:
"have to not cause the" in 1 place: 22.4.3.2.

Change "receivers must meet" to:
"receivers have to meet" in 1 place: 22.4.4.

Change "drivers must be" to:
"drivers have to be" in 1 place: 22.4.4.2.

Change "shield must provide" to:
"shield has to provide" in 1 place: 22.4.5.5.

General 25

Change "must be separated" to:
"have to be separated" in 1 place: 23.11.2 TX_SKEW.

Change "must also support" to:
"also have to support" in 2 places: 23.12.3 *MII, 32.13.2 *MII.

Change "Must have a clock" to:
"Have a clock" in 1 place: 23.12.4.4 PCO11.

Change "Must not set" to:
"Does not set" in 5 places: 23.12.4.13 PME34, PME35, PME36, PME37, PME38.

Change "it must wake" to:
"it has to wake" in 1 place: 24.2.3.4 lpi_tx_tq_timer.

Change "must temporarily" to:
"has to temporarily" in 1 place: 24.3.1.6.1.

Change "must naturally be" to:
"naturally has to be" in 1 place: 24.3.2.2.

General 26

Change "must meet the performance" to:
"has to meet the performance" in 1 place: 27.3.1.4.3.

Change "It must then follow" to:
"It has to then follow" in 1 place: 27.3.2.1.2 source_type(X).

Change "function must provide" to:
"function has to provide" in 1 place: 28.1.4.

Change "must exist" to:
"has to exist" in 1 place: 28.1.4.

Change "must recognize" to:
"has to recognize" in 1 place: 28.1.4.1.

Change "must take the" to:
"has to take the" in 1 place: 28.1.4.3.

Change "must implement and" to:
"has to implement and" in 1 place: 28.2

General 27

Change "devices must" to:
"devices have to" in 2 places: 28.2.3.4.13 a) and b).

Change "must start" to:
"has to start" in 1 place: 28.2.5 Note.

Change "must transmit" to:
"transmits" in 1 place: 28.5.4.5 AF31.

Change "must provide logical" to:
"provides logical" in 1 place: 28.5.4.6 MF27.

Change "things must be done" to:
"things have to be done" in 1 place: 28.6.

Change "must be selected" to:
"has to be selected" in 1 place: 28.6.

Change "must be allocated" to:
"has to be allocated" in 1 place: 28.6.

General 28

Change "must be established" to:
"has to be established" in 1 place: 28.6.

Change "must be adjusted" to:
"has to be adjusted" in 2 places: 19.2.2.2, 30.2.2.2.2 Activity Timing function.

Change "Capability must be implemented" to:
"Capability has to be implemented" in 1 place: 30.2.5.

Change "must be implemented as a group" to:
"have to be implemented as a group" in 2 places: 14.2.1 Note 2, 18.3.1, Note 2.

Change "parameter must be implemented" to:
"parameter has to be implemented" in 1 place: 14.10.4.1.

Change "impedance must be implemented" to:
"impedance has to be implemented" in 1 place: 10.7.2.2.

Change "must be taken into" to:
"has to be taken into" in 1 place: 30.3.2.1.3 Note.

General 29

Change "must be met or" to:
"has to be met or" in 4 places: 30.3.6.1.34, 30.3.6.1.36, 30.3.6.1.38, 30.3.6.1.40.

Change "care must be taken to" to:
"care has to be taken to" in 2 places: 32.6.1.3.1, 32A.

Change "must be artificially" to:
"has to be artificially" in 1 place: 22C.1.

Change "must be met over" to:
"have to be met over" in 1 place: 22C.4.

Change "must be fulfilled" to:
"have to be fulfilled" in 1 place: 1.2.1.

Change "ports must meet" to:
"have to meet" in 1 place: 1.2.1.

Change "that must match" to:
"that has to match" in 1 place: 1.2.1.

General 29

Change "must have insertion" to:
"have to have insertion" in 1 place: 1.4.319.

Change "must acquire" to:
"has to acquire" in 1 place: 1.4.503.

Change "must take into" to:
"has to take into" in 4 places: 2.3.1.5, 2.3.2.5, 8.3.1.5 Note, 10.4.1.5 Note.

Change "must not react" to:
"does not react" in 1 place: 4.2.3.2.6.

Change "mode must be at least" to:
"mode has to be at least" in 2 places: 4.2.4.2.2 (2 places).

Change "of a burst must" to:
"of a burst has to" in 1 place: 4.2.4.2.2.

Change "within a burst must" to:
"within a burst have to" in 1 place: 4.2.4.2.2.

General 30

Change "must wait for" to:
"has to wait for" in 3 places: 4.2.7.2 var, 9.5.6.5, 4A.2.7.2 var.

Change "must be run" to:
"has to be run" in 2 places: 4.2.7.4, 4A.2.7.4.

Change "must be an" to:
"has to be an" in 1 place: 4.2.9.

Change "frame must be at least" to:
"frame has to be at least" in 1 place: 4.2.9.

Change "segment must be configured" to:
"segment have to be configured" in 1 place: 4.4.3.

Change "MAC must be configured" to:
"MAC has to be configured" in 1 place: 4.4.3.

Change "shields must provide" to:
"shields have to provide" in 1 place: 7.4.3.

General 31

Change "the signal must be" to:
"the signal has to be" in 3 places: 8.2.1.2, 8.4.1.4, 10.5.1.4.

Change "sections must be used" to:
"sections have to be used" in 1 place: 8.6.2.1.

Change "must also be controlled" to:
"also has to be controlled" in 2 places: 8.6.2.2, 10.7.2.2.

Change "path must meet" to:
"path has to meet" in 1 place: 8.7.2.4.

Change "must fill in" to:
"has to fill in" in 2 places: 8.8.3.1, 14.10.4.2.

Change "supplier must indicate" to:
"supplier should indicate" in 2 places: 8.8.5, 14.10.4.2.

Change "Must not cause output" to:
"Does not cause output" in 5 places:
8.8.7.3 Item 1, 8.8.7.4 Item 1, 14.10.4.6.3 DO3, 16.6.6.23 DO3, 18.5.6.19 DO3.

General 32

Change "If used, must be to" to:
"If used, is to" in 3 places: 8.8.7.5 Item 1, 16.6.6.24 ACT1, 18.5.6.20 ACT1.

Change "must be counted" to:
"has to be counted" in 1 place: 9.1.

Change "must occur no" to:
"has to occur no" in 1 place: 9.9.2.1.

Change "pulse must meet" to:
"pulse has to meet" in 1 place: 9.9.2.1.

Change "must all be" to:
"should all be" in 1 place: 9.9.2.8 Note.

Change "must draw" to:
"has to draw" in 1 place: 10.4.1.2.

Change "times must match" to:
"times have to match" in 1 place: 10.4.1.3.

General 33

Change "circuit must be transmitted" to:
"circuit have to be transmitted" in 1 place: 10.4.1.4.

Change "MAU must provide" to:
"MAU has to provide" in 2 places: 10.4.2.1, 11.3.3.1.

Change "must be reduced" to:
"has to be reduced" in 1 place: 11.5.3.

Change "must be one" to:
"has to be one" in 1 place: 12.2.1.

Change "PMAs must meet" to:
"PMAs have to meet" in 3 places: 12.4.3.2.1 (3 places).

Change "PMA must meet" to:
"PMA has to meet" in 1 place: 12.4.3.2.1.

Change "must exceed that" to:
"has to exceed that" in 3 places: 12.5.3.1.3, 12.7.3.3, B.4.3.4.

General 34

Change "must not exceed" to:
"should not exceed" in 1 place: 12.7.2.3 Note 3.

Change "imbalance must be limited" to:
"imbalance have to be limited" in 1 place: 12.7.3.

Change "remainder must be" to:
"remainder have to be" in 1 place: 13.3 e).

Change "must be performed twice" to:
"have to be performed twice" in 1 place: 13.4.1.2.

Change "MAU must be capable" to:
"MAU has to be capable" in 1 place: 14.2.1.8.

Change "must be continuously" to:
"has to be continuously" in 3 places: 14.2.3.2 unjab_timer, 16.3.9.2 unjab_timer, 18.3.2.2 unjab_timer.

Change "crosstalk must be limited" to:
"crosstalk has to be limited" in 1 place: 14.4.3.

General 35

Change "it must be as" to:
"it has to be as" in 1 place: 14.10.4.1.

Change "must be filled" to:
"has to be filled" in 1 place: 14.10.4.2.

Change "CS0 must not be sent" to:
"CS0 is not sent" in 2 places: 14.10.4.5.6 SF5, 18.5.6.13 STF5.

Change "Must be via" to:
"Has to be via" in 1 place: 14.10.4.5.15 SR1.

Change "If used must be to" to:
"If used, is to" in 1 place: 14.10.4.6.5 CT1.

Change "must be cascaded" to:
"have to be cascaded" in 1 place: 15.1.3.4.

Change "must be used to" to:
"have to be used to" in 2 places: 15.1.3.4 (2 places).

General 36

Change "but must meet" to:
"but have to meet" in 1 place: 15.3.2.

Change "computation must be done" to:
"computation has to be done" in 1 place: 16.3.4.2.

Change "must be zero" to:
"has to be zero" in 1 place: 16.3.4.2.

Change "must be HI." to:
"has to be HI." in 1 place: 16.3.4.2.

Change "must have no" to:
"has to have no" in 1 place: 17.3.10.2 rcv_unjab_timer.

Change "delay must be calculated" to:
"has to must be calculated" in 1 place: B.1.5.2.

Change "conditions must be" to:
"conditions have to be" in 1 place: B.1.5.2.

General 37

Change "DTE1 must" to:
"DTE1 has to" in 2 places: B.1.5.2 (2 places).

Change "length must allow" to:
"length has to allow" in 1 place: B.2.2.

Change "length must exceed" to:
"length has to exceed" in 1 place: B.2.2.

Change "link must be" to:
"link has to be" in 1 place: B.2.3.

Change "receiver must operate" to:
"receiver has to operate" in 1 place: B.2.3.

Change "must be long" to:
"has to be long" in 1 place: B.4.3.1.

Change "function must defer" to:
"function has to defer" in 1 place: 4A.1.2.

Changes to de-mustify 802.3ct and 802.3cp

IEEE Std 802.3ct-2021 and IEEE Std 802.3cp-2021 1

Change "a conforming implementation must behave functionally as though" to:
"a conforming implementation behaves functionally as though" in 3 places:
Table 154-1 footnote a, Table 159-1 footnote a, Table 160-1 footnote a.

Change "the maximum differential group delay that the system must tolerate" to:
"the maximum differential group delay that the system is required to tolerate" in 4 places:
Table 154-9 footnote b, Table 158-14 footnote c, Table 159-12 footnote c, Table 160-12 footnote c.

Change "must be kept within limits" to:
"is kept within limits" in 2 places: 154.3.2, 160.3.2.

Change "The Skew Variation must also be limited to ensure" to:
"The Skew Variation is also limited to ensure" in 2 places: 154.3.2, 160.3.2.

Change "and PHY implementers must conform to" to:
"and PHY implementers conform to" in 1 place: 157.4.

Change "must be corrected for" to:
"has to be corrected for" in 2 places: 158.8.10.3, 159.7.5.3.

Change "must be met at" to:
"has to be met at" in 1 place: 154.9.13.

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Change "As an unavoidable consequence of the requirements for the setting of the SIGNAL_DETECT parameter, implementations must provide adequate margin" to:
"As a consequence of the requirements for the setting of the SIGNAL_DETECT parameter, implementations need to provide adequate margin" in 2 places: 159.5.4, 160.5.4.

Thanks!